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No. 88-2047

IN THE

Supreme Court of the United States

OCTOBER TERM, 1988

AXELSON, INC.,

Petitioner,

v.

CAMERON IRON WORKS, INC.,

Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

PETITION FOR CERTIORARI

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June 13, 1989

QUESTION PRESENTED

Did the Court of Appeals ignore due process in upholding the district court's decision that the patent issued to Williams is valid in spite of testimony and evidence indicating that the Williams patent was improperly issued by the United States Patent and Trademark Office?

STATEMENT UNDER RULE 28.1

Pursuant to Rule 28.1 of this Court, petitioner Axelson, Inc. states that it is a corporation. It further states that the petitioner involved in this case is Axelson, Inc., a subsidiary of its parent corporation, US Industries Management Services, Inc. Axelson, Inc. does not have an ownership interest in any subsidiary corporations or affiliates.

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PETITION FOR CERTIORARI

Petitioner Axelson, Inc. respectfully prays that a writ of certiorari issue to review the judgment of the United States Court of Appeals for the Federal Circuit entered in this proceeding on February 16, 1989. Appellant's petition for rehearing in the Federal Circuit was denied on March 15, 1989.

OPINIONS BELOW

The opinion of the United States Court of Appeals for the Federal Circuit has not been prepared for publication in a printed volume. A short statement affirming the district court opinion appears herein at Appendix A-1.

JURISDICTION

The judgment of the Court of Appeals for the Federal Circuit was entered on February 16, 1989. A timely petition for rehearing was denied on March 15, 1989. The present writ was filed within 90 days thereafter. The jurisdiction of this Court is invoked under 28 U.S.C. § 1254(1).

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

One Constitutional provision is relevant to this petition. The Constitutional provision is the Fifth Amendment, which reads as follows in pertinent part:

> "No person shall . . . be deprived of life, liberty, or property, without due process of law . . . ."

Additionally, one statutory provision is relevant to this petition. The statute at issue is 35 U.S.C. § 103, which provides:

> "A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."

The statutory provision at issue, 35 U.S.C. § 103, is reproduced in full in the Appendix (A-2) and cited in pertinent part in the discussion of the reasons for granting the writ.

STATEMENT OF THE CASE

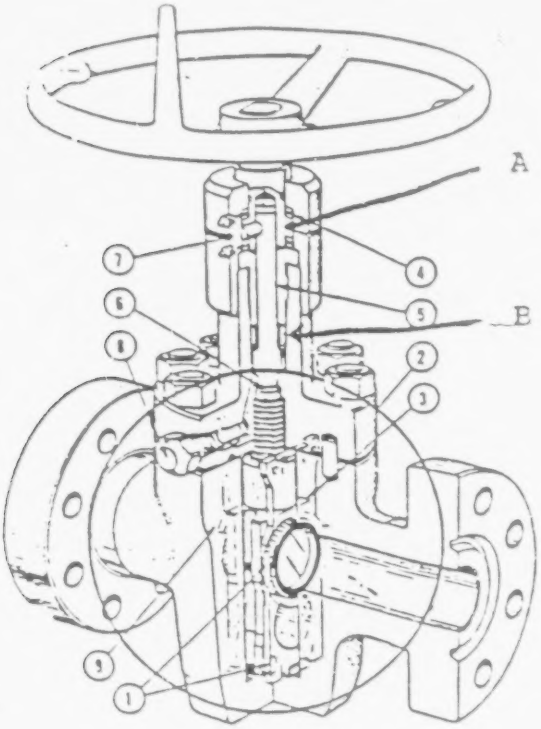
I. Background

This is a patent case. It arises out of an infringement proceeding in the United States District Court for the Southern District of Texas, Houston Division. The plaintiff in that proceeding was Cameron Iron Works, Inc. ("Cameron"), and the defendant was Axelson, Inc. ("Axelson"). Axelson appealed the district court judgment to the United States Court of Appeals for the Federal Circuit. Following an adverse holding in the Federal Circuit (See Appendix A-1), Axelson petitioned the Federal Circuit for a rehearing. Following the denial of its request for rehearing, Axelson petitioned this Court for redress of its grievances.

The technical subject matter here in issue is relatively simple. It relates to gate valves used on oil and gas wells to control the flow of production fluids. The patent at issue is United States Patent 4,214,600 ("the '600 patent") (Appendix A-3). The '600 patent issued to Williams and Taylor on July 29, 1980.

Gate valves have been in existence for many years and they all generally include a valve body having a chamber and a flow passage extending through the valve body and intersecting the chamber, and a gate valve member that is movable in the valve body chamber between an open position in which flow is permitted and a closed position in which flow is blocked. The valve includes a bonnet that is connected to the valve body. The bonnet has a bore through which a valve stem passes. The valve stem is connected to the gate and manipulation of the stem causes the gate to move back and forth between the open and closed positions. Most gate valves include a "back seat" which provides a shoulder on a stem that is engageable with a seat in the bonnet bore. The back seat is operable to form a metal to metal seal between the stem and bonnet in the event of a packing leak or if it is desired to change the stem packing under pressure.

At least as early as 1964, Cameron began selling its standard Type "F" gate valve. The Cameron Type "F" is a non-rising stem valve, which means that the stem does not move up and down as the gate is moved between its open and closed positions. The stem has a threaded portion at its inner end to engage the gate. Rotational motion of the stem is transmitted by the threads into linear motion of the gate. The Type "F" gate valve is illustrated below:



Cap = 7
Bearing = A
Packing = B
Stem Valve = 6
Main Valve = 1

The stem of the Cameron Type "F" gate valve includes a shoulder that may be moved into engagement with a seat around the bonnet bore to form a back seat. The stem shoulder

is normally spaced apart from the bonnet seat so that the stem may be rotated. If the stem shoulder and bonnet seat were not held spaced apart, then the stem could not be rotated and the valve could not be opened or closed. When it is desired to seat the stem shoulder on the bonnet seat, as for example in the case of a packing leak, the bearing cap is backed off so as to allow the stem to move outwardly.

In late 1970, a multiple well fire resulted in the loss of an off-shore platform in the Gulf of Mexico. In early 1971, Cameron examined well head equipment recovered from that fire to study the effects of fire on such equipment. During the course of that study, it became apparent that the packing of valves such as the standard Type "F" gate valve burned out during fires and allowed fluid to leak between the stem and bonnet, thereby feeding the fire. William M. Taylor, a Cameron employee who was studying the equipment and one of the inventors named in the '600 Patent, quickly conceived of a simple modification to make the standard Cameron Type "F" gate valve fire resistant. Taylor's conception involved placing a ring of fusible or eutectic material in the cap above the bearing of the Cameron Type "F" gate valve to space apart the bearing in the cap and thus hold the valve stem members apart as long as the fusible ring was intact. The eutectic material was adapted to melt and vacate the space between the bearing and the cap upon exposure to excessive heat. This melting allows the stem to move outwardly of the bonnet until the stem shoulder seats on the bonnet in the same way that the stem moves outwardly when the cap is backed off of the standard Cameron Type "F" gate valve.

Taylor's idea in 1971 never went beyond the conceptual stage and it was never commercialized because there was no customer interest in such a valve. Cameron did not file a patent application based upon Taylor's conception because Cameron believed the modified gate valve was unpatentable.

In early 1978, certain members of the Shell Group became interested in containing oil and gas on platforms during fires for relatively short periods of time. In general, the Shell Group companies were looking for a fire resistant well head and Christmas tree with metal to metal seals. Two of the Shell Group companies requested that Cameron submit a quotation for certain fire resistant well head equipment. In response to Shell's request, Cameron again in a short time conceived the same simple modification of the standard Type "F" gate valve that Taylor had conceived in 1971. The 1978 conception, which was totally independent of the 1971 conception and without knowledge of it, is attributed to Leonard E. Williams, Jr., a Cameron employee and the other named inventor in the '600 Patent.

On February 15, 1979, Williams and Taylor filed U.S. Application Serial No. 012,383, which resulted in the '600 Patent. The Williams and Taylor patent application was assigned to Examiner Arnold Rosenthal in patent examining group art unit 341.

Prior to the filing of the patent application that resulted in the '600 Patent, John K. McGee, an employee of Gray Tool Company, filed U.S. Patent Application Serial No. 955,232, disclosing the same invention as that in the '600 Patent, but claiming the invention in much narrower fashion. McGee modified a standard Gray Tool Company valve in the same way that Williams and Taylor modified the standard Cameron valve. The McGee patent application was assigned to a different Examiner in patent examining group art unit 341. About the time that McGee, on the one hand, and Williams and Taylor, on the other hand, modified their respective companies' gate valves, employees of McEvoy Oil Field Equipment Company made the same modification of a standard McEvoy gate valve.

On January 20, 1980, the Examiner in charge of the Williams and Taylor application allowed all of the claims of that application. On February 15, 1980, however, the Examiner in charge of the McGee application rejected all of its claims under 35 U.S.C. § 103 as being obvious. McGee drastically amended his claims, and following an interview between the Examiner and McGee's attorney, the McGee application was allowed.

The '600 Patent issued July 29, 1980. On December 30, 1980, McGee filed a second application after copying claims 1-3 and 6-10 from the '600 Patent, thereby provoking an interference with the '600 Patent. In the interference, McGee alleged that the day he first disclosed the invention defined by the counts was on or before March 15, 1978 and that he actively exercised reasonable diligence toward reducing the invention practice on or before March 31, 1978. McGee did not, however, actually reduce to practice the invention defined by the counts before the October 27, 1978 filing date of the original McGee patent application. Williams and Taylor alleged in the interference that they were joint inventors of the subject matter of the counts, despite the fact of their separate and completely independent conceptions some seven years apart. They alleged that their invention was first disclosed to others on July 28, 1978, which is the date of Taylor's independent conception. They also alleged that they began the active exercise of reasonable diligence towards reducing the invention to practice on May 17, 1978, which is the date Williams is alleged to have independently conceived the invention. Williams and Taylor alleged a reduction to practice of the invention defined by the counts on June 21, 1978.

The interference was settled about March 3, 1983, by the exchange of licenses between Cameron and Combustion Engineering, the Assignee of the patent resulting from the original McGee application. McGee conceded priority of invention to Williams and Taylor on June 3, 1983, and the interference was

terminated. However, as of the date of trial below, Combustion Engineering had made only one payment of very nominal royalties under the license.

Meanwhile, in early 1980, B.R. Bruton and David E. Snyder, employees of Axelson, conceived the Axelson valves that are alleged to infringe the '600 Patent. Bruton and Snyder conceived and made the Axelson valves without knowledge of any Cameron activities in connection with its fire resistant manual gate valve.

The Axelson heat sensitive manual gate valve, available in two models, operates as a standard manual gate valve, but has the capacity when exposed to fire to move either to its fully open or fully closed position. The stem of the Axelson valve includes a stem shoulder and the bonnet includes a seat. When the Axelson heat sensitive manual gate valve is in its open position, the stem shoulder is spaced apart from the bonnet seat; however, when the valve is in its closed position, the stem shoulder is seated on and not spaced apart from the bonnet seat. The Axelson fire safe manual gate valve includes a fusible element allowing the stem to move to its fully outward position with respect to the bonnet in the event of fire. If the valve is in its open position in a fire, the valve closes. If the valve is already closed, however, the stem shoulder is already seated on the bonnet seat and no movement occurs.

II. The Trial Court's Fact Findings on the Issue of Obviousness

Regarding the scope and content of the prior art, the trial court made no fact finding consistent with the true state of the art in 1978, the time of Cameron's alleged invention. The trial court focused only on the prior art Volpin patent and its arrangement of elements and thus the state of the art in 1947 (the Volpin patent appears in the Appendix at A-15).

The Court ignored the fact that the prior art by 1978 (and since 1965) included the unmodified Type "F" valve of Cameron with the exact arrangement of elements (less the fusible washer of Volpin) as the valve of the '600 patent-in-suit[1], as well as other relevant prior art. Regarding the differences in the claimed invention and the prior art, the trial court recognized that all of the elements of the claims were present in Volpin, but focused only on the alleged differences in the arrangement of the elements:

> [B]ut the arrangement of the elements seems to make a critical difference . . . that rearranging the elements from the Volpin arrangement to the Cameron arrangement, assuming that the principle purpose in Volpin is converting a stop to a seal, appears to be enough of a difference to make that not prior art that would invalidate the patent.

Transcript of Ruling Before the Honorable Lynn N. Hughes United States District Judge, May 21, 1987, p.5 (hereinafter "Transcript").

The trial court recognized that the elements of the alleged "invention" of the '600 patent *did not function differently than the previous Volpin invention:*

> But, the arrangements of the elements that makes it different from Volpin is an arrangement of the elements in Volpin to achieve a—*it's not categorically a different function.* It's a better function which I as understand is patentable.

Transcript, p. 11 (emphasis supplied).

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[1] The alleged invention came about as the result of a modification of the Type "F" valve by adding a fusible washer. *The patent Examiner was never told that the unmodified Type "F" valve was prior art.*

Cameron's own witnesses, co-inventor Taylor, practically admitted that there were no patentably significant differences between the technology of the '600 patent and the prior art. Taylor admitted:

> Q. . . And the Volpin patent discloses, does it not, the use of a back seat on a stem in order to close off flow around the stem?
>
> A. Yes.
>
> Q. In the case of fire?
>
> A. Yes.
>
> Q. And uses a fusible element that functions as a spacer to maintain that back seat?
>
> A. Yes.
>
> Q. And that spacer is located on top of the bearing in this Volpin valve, isn't it?
>
> A. Yes.
>
> Q. And you located your spacer on top of the bearing in the Cameron valve you designed, didn't you?
>
> A. Yes. It's on top of the bearing.
>
> Q. The fact is, is it not, Mr. Taylor, that in the Volpin patent if the fire melts the fusible element the intent is for the fire then to -- or for the fusible element then to melt and for the valve to then seat with the stem shoulder seating?
>
> A. Yes, sir.
>
> Q. And moves then a short distance necessary to do that?
>
> A. Yes.
>
> Q. And in the Cameron valve that was modified by you to have the fusible element, it works exactly the same way, and the intent is if the fire will melt the

> fusible element the spacer function then disappears and the valve stem moves up to seat the stem; is that correct?
>
> A. Its heat responsive behavior is the same.

Transcript of Trial Before the Honorable Lynn N. Hughes United States District Judge; Volume I, May 19, 1987, p. 102-104.

Further, the trial court's statement regarding "40 or 50 existing things" reveals a basic misunderstanding of the facts disclosed at trial. The court erroneously stated:

> But it didn't make it unpatentable if you take 40 or 50 existing things and combine them in a way that is uniquely efficient to accomplish something everybody always wanted to do.

Transcript, p. 11.

This statement illustrates the trial court's confusion that led to its blatant error. Cameron took only one "thing" from the prior art and added it, *as taught by Volpin*, to its existing prior art valve. It did not combine 40 or 50 things to obtain a new or better function.[2] Cameron did not accomplish something everyone always wanted to do—four different individuals did it independently each time the need arose. The trial court's error regarding the true scope of the prior art and Cameron's alleged contribution to valve technology is staggering when considered in light of the evidence presented at trial.[3]

The trial court never explained the alleged critical difference he was referring to and there was nothing in the record below to support such a conclusion.

Regarding the level of skill in the art, the trial court made a correct finding that the level of skill in 1978 was high and

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[2] The trial court also erroneously referred to the prior art providing two-fifths of the arrangement (and Cameron providing five-fifths) which again is contrary to the evidence (See Transcript, p. 21) as stated herein.

[3] The trial court also erroneously found, on page 4, that Cameron converted the stem metal to metal seal from being primarily a stop to primarily a seal, contrary to the uncontroverted evidence that the stem seal had been used as a fire seal for years before 1978.

sophisticated, and that the evidence established graduate engineers with five (5) years or so of experience were designing the valve in question. *See Transcript*, p. 30. The trial court, however, made no findings regarding the secondary considerations present in this case. This constitutes clear error since these considerations point to the objective evidence of the obviousness of the claimed invention in 1978 in view of the relatively high level of skill in the art and the lack of any significant difference in the claimed invention and the prior art in 1978.[4]

III. The Claims at Issue

The two independent claims at issue, labeled by Cameron in its trial exhibits, are as follows:

What is claimed is:

1. A valve, comprising

[A] a body having a chamber open on the top and a passage extending through the body and in communication with the chamber,

[B] a valve member movable in the chamber to open and close flow through said passage,

[C1] a bonnet having a central bore with a seat facing

[C2] downward within said bore,

[D] means securing the bonnet to the body around the chamber opening,

[E] a stem extending through said bonnet bore and threadedly engaging said valve member,

[F] an upwardly facing shoulder on the stem being normally in spaced relationship to said seat,

[4] It is hard to imagine better objective evidence of obviousness than *four independent conceptions* of the *same solution* to the *same short-term problem*.

[G] bearing means between the stem and the bonnet,

[H] packing means sealing between the stem and the bonnet at a position between the seat and said bearing means,

[I1] a fusible element positioned in supporting relationship

[I2] to said bearing means and normally retaining the stem shoulder spaced from the bonnet seat,

[J1] said fusible element being adapted, when heated, to relax its support of said bearing means so that the stem shoulder seats on the bonnet seat to prevent

[J2] leakage around the stem whereby failure of said packing means as a result of heat does not result in fluid leakage around the stem.

* * *

10. A valve, comprising

[A] a housing having a flow passage therethrough and a generally tubular shaped extension transverse to the passageway, the bore of which terminates in a chamber intersecting the passageway,

[B] a closure member in the chamber,

[C] stem in the bore for moving the closure member,

[D] a shoulder on the stem,

[E] a seat in the bore,

[F] sealing means in the bore between the stem and said extension outwardly of the seat in the bore,

[G] thrust bearing means in the bore outwardly of the sealing means,

[H] said bearing means being attached to the stem and slidable in the bore,

[I] an inwardly-facing shoulder in the housing outwardly of the bearing means, and

[J] a fusible element in the bore sandwiched between said inwardly-facing shoulder and the bearing means,

[K1] said stem shoulder being normally spaced toward the closure member from said bore seat but sealingly

[K2] engaging the bore seat upon melting of the fusible element, responsive to pressure in the chamber to prevent fluid flow outwardly around said stem.

REASONS FOR GRANTING THE WRIT

The Fifth Amendment to the United States Constitution provides that "[n]o person shall . . . be deprived of life, liberty, or property, without due process of law." The testimony, evidence and erroneous findings of the trial court deprived defendant Axelson of its liberty and property rights in its valve products. This decision occurred in the face of overwhelming evidence pointing to the invalidity and noninfringement of the Williams patent.

This is a patent case of paramount public interest. Seldom will this Court have before it a claimed invention and factual circumstances surrounding it which so blatantly point to §103 obviousness. By affirming the District Court's judgment the Court of Appeals for the Federal Circuit failed to give adequate consideration to the doctrine of obviousness, 35 U.S.C. §103, the Supreme Court's trilogy on §103, *Graham v. John Deere, Cook Chemical Co. v. Colgate-Palmolive*, both 383 U.S.1, 86 S.Ct. 684 (1966), and *United States v. Adams*, 383 U.S. 39, 86 S.Ct. 708 (1966), and to the trial court's erroneous fact findings and error of law on this issue.

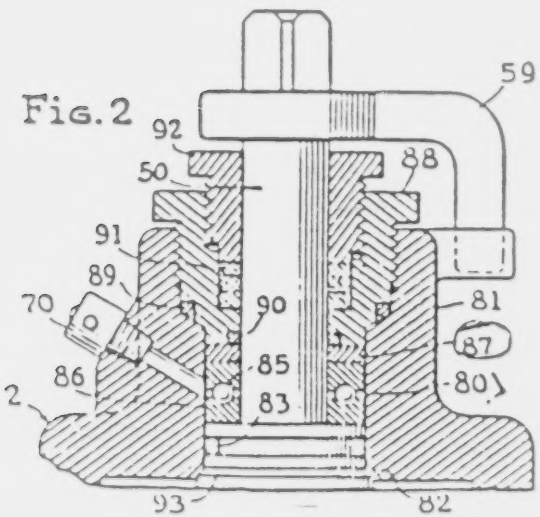
The Federal Circuit Court of Appeals erred when it held that Axelson failed to meet its burden of showing error below. The trial court's confusing and convoluted fact findings in this case were oral findings made from the bench at the close of

trial. It is difficult to determine what findings were actually made. The findings that can be discerned regarding the scope and content of the prior art and the differences in this art and the claimed invention are clearly erroneous when considered with the uncontroverted facts of this case.

IV. The True and Uncontroverted Facts Regarding the State of the Art in 1978, Not Appreciated or Found by the Trial Court or the Federal Circuit, Demonstrate the Obviousness of the Claimed Invention

Specifically, turning to the facts of this case:

1) In *1947* the prior art taught that a valve containing a metal to metal stem seal could be made fire safe by placing a *fusible washer on top of a bearing* to maintain spacing between the valve stem members during normal operation of the valve, but which melted in the presence of a fire to close the valve stem metal to metal seal. Volpin discloses:



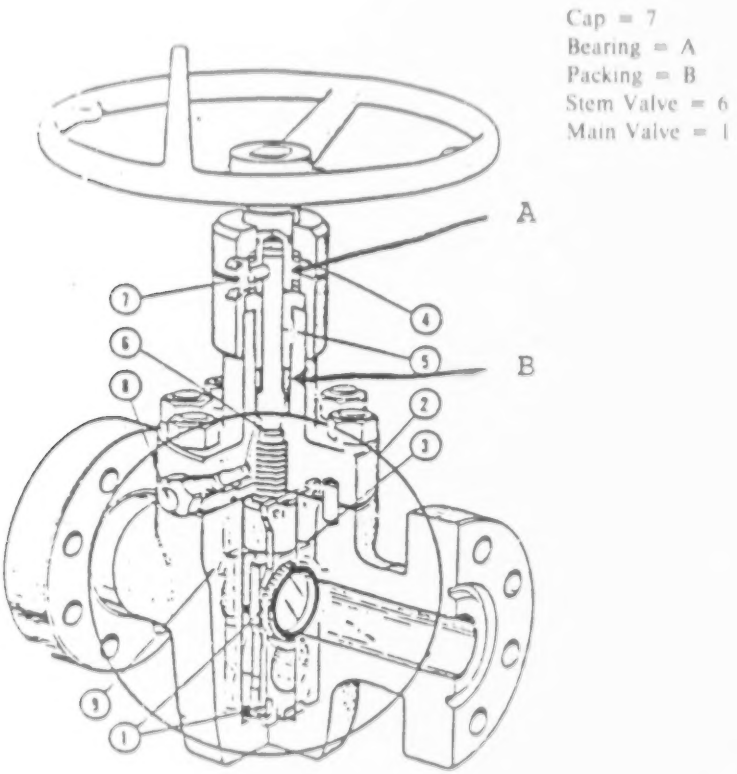
Cap = 92 + 88
Packing = 91
Fusible washer = 87
Bearing = 85
Stem Valve = 82 + 93
Main Valve = not shown in this figure, but shown in Fig. 1 of the Volpin patent (Appendix, A-15).

> Volpin expressly teaches, *inter alia*,
>
> Broadly, the invention contemplates . . . a fusible member arranged in the valve stem packing assembly so as to permit the creation of a metal to metal seal when the valve is subjected to excessive heat.

Appendix, A-20.

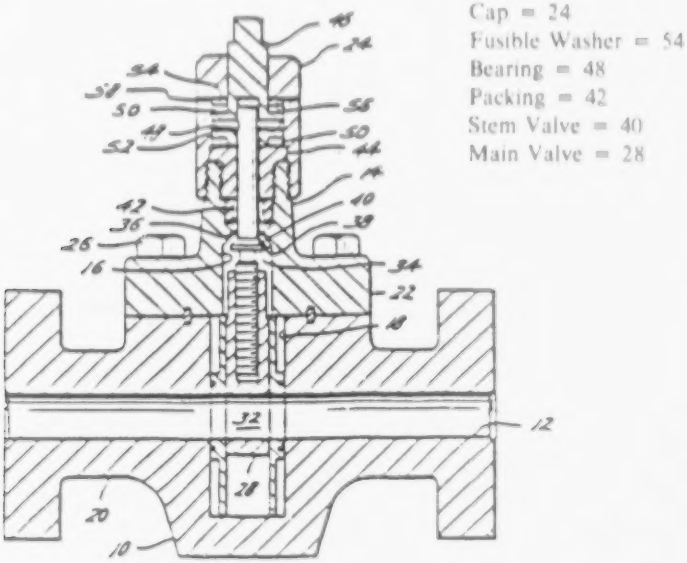
All of the elements A through J2 and A through K2 of Claims 1 and 10 are present in Volpin, however, the element H in Claim 1 and F in Claim 10 (the packing means) is not located as stated in the claim (i.e., it is not between the stem valve seat and the bearing means).

2) By spring, 1978, the date of Cameron's alleged invention, the prior art also included, *inter alia*, the Cameron type "F" valve sold for fifteen years *with the bearing located outside the stem packing*, as shown below:



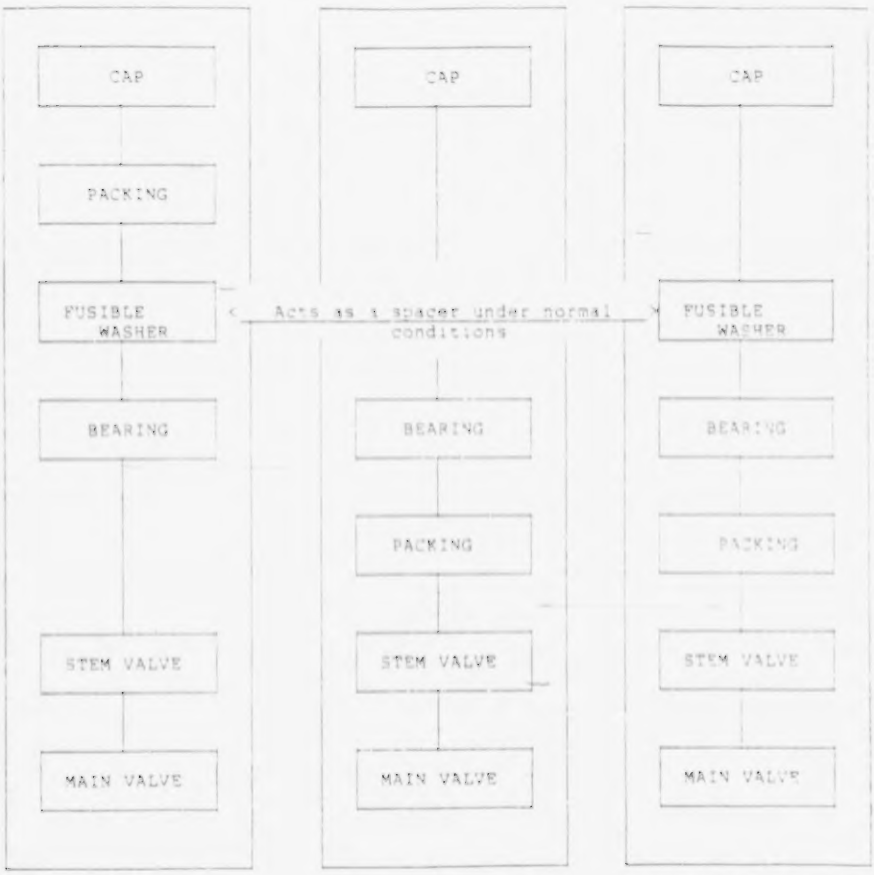
All of the elements A-J2 of Claim 1 and A-K2 of Claim 10 are in the prior art Type "F" valve *and in the same arrangement as in the claims*, except that the fusible element of Volpin (I1 of Claim 1 and J of Claim 10) is not present.

3) Cameron's *only* arguably "inventive act" was to take the fusible element of Volpin, *for the same exact purpose and function*, and place it on top of the bearing in the type "F" valve as *specifically* taught by Volpin. No parts of the old type "F" valve were changed or rearranged. In the words of Claim 10, element J, a fusible element was "sandwiched between said inwardly facing shoulder (inside wall of the cap) and the bearing means." When this was done, the valve members functioned as before and the fusible element and the valve stem member functioned exactly as taught in Volpin. The resulting valve on which Cameron obtained a patent is shown below:



The following schematic illustrates the Volpin 1947 arrangement and combination of elements, the standard pre-1978 Cameron Type "F" arrangement and combination of

elements, and the Cameron patented valve and its arrangement and combination of elements:



As noted above, the trial court made only one clear finding supported by the record mandated by *Graham*. That was a finding that the level of skill in the art was high and sophisticated. It made no clear finding regarding the scope and content of the art in 1978 or regarding the differences between the *claimed* invention and the prior art. What findings it did make, if they can be discerned, were clearly erroneous. Thus, the trial court ignored the uncontroverted evidence that (1) the *only* difference between the claimed invention as a whole and the prior art as a whole in 1978 was the placement of a fusible washer on top of the bearing in the prior art Cameron Type "F" valve for the *exact same* purpose as in Volpin, and (2) this placement and its resulting function was *specifically* taught by Volpin.[5]

Significantly, the Federal Circuit and the trial court did not have to speculate on what was obvious to persons skilled in the art in 1978 because the objective facts point directly to a holding of obviousness. There was no long felt need. When the problem arose in 1971 and then again in 1978, *four* different individuals skilled in the art independently responded promptly with the same Volpin invention. Cameron established no nexus between its alleged commercial success and the claimed invention. One of Cameron's alleged inventors, Taylor, practically admitted the obviousness of what was done.

Of course, these *facts were not known to the Patent Examiner*. It was clear *error of law* for the trial court to replace this objective evidence with its own subjective conjecture.

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[5] While Volpin was before the patent Examiner, an unmodified type "F" valve was not. *Cameron never told the patent Examiner that all it did was unscrew the cap on the top of a prior art valve* and put a fusible washer on top of the bearing to act as a spacer.

V. The Clear Mandate of *Graham* Requires the Court to Reverse Federal Circuit and the Trial Court's Conclusion of Non-Obviousness

While the Federal Circuit has done much to breathe life back into the patent system by a more reasoned approach to the issues of patent validity, there is a point at which an alleged invention claimed in a patent, issued and presumed valid, does not meet the statutory requirements of § 103, nor the test of *Graham*. That point is reached in this case.

This Court, in *Graham*, held invalid a patent for a minor improvement to a plow. The Fifth Circuit had held the patent valid because the invention produced an "old result in a cheaper and otherwise more advantageous way." This holding was reversed. Like the alleged improvement in this case, the claimed improvement in *Graham* related to a different arrangement of the elements — the same distinction made by this Court in referring to the difference in the Cameron claimed valve and the Volpin patent. The claimed difference resulted in some advantages (more flexing of the plow shank to avoid breakage in rocky terrain), but this Court found that the changes made to obtain these advantages were obvious.

In discussing the background of 35 U.S.C. § 103 and the role of Congress in laying down statutory guidelines on patentability, this Court stated regarding the patent grant:

> Only inventions and discoveries which furthered human knowledge, and were new and useful, justified the special inducement of a limited private monopoly. Jefferson did not believe in granting patents for small details, obvious improvements, or frivolous devices.

Graham at 689.

Quoting from an earlier Supreme Court case (*Hotchkiss v. Greenwood*, 52 U.S. 248, 13 L.Ed. 683 (1851)), the *Graham* Court stated:

> [U]nless more ingenuity and skill . . . were required . . . than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skillful mechanic, not that of the inventor."

Id at 690.

This Court has set forth the basic factual findings that the Courts must make to determine obviousness (a legal question) in a particular case. Additionally, this Court has admonished the U.S. Patent and Trademark Office to follow established precedent, noting: "We have observed a notorious difference between the standards applied by the Patent Office and by the Courts." *Id.*

This Court announced, in *Graham*, that while the structural difference between the claimed invention in suit and the prior art (i.e., the reversal of elements as was done in this case by Cameron) permitted more free flexing of the plow shank (thus making it less susceptible to breaking in rocky terrain), this minor difference was *not enough for patentability*.[6] This Court noted:

> Certainly a person having ordinary skill in the prior art, given the fact that the flex in the shank could be utilized more effectively if allowed to run the entire length of the shank, would immediately see that the thing to do was what Graham did, i.e., invert the shank and the hinge plate.

Id at 697.

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[6] Here, Cameron argues that its arrangement of the fusible element towards the outside of the valve ensures that the fusible element is exposed to heat and melts before the packing is damaged. However, this was recognized by pre-1978 prior art, and even Cameron's own witness acknowledged this fact.

The *Graham* holding was in 1965. Surely by 1978, in the oilfield valve art, where many complex subsea drilling and production problems were being handled routinely by skilled workers in the art, and where the level of skill is relatively high and sophisticated, one of ordinary skill could readily modify the old Cameron Type "F" valve by simply adding a fusible element as taught by Volpin and others without resort to "invention."

If this Court upholds the Federal Circuit Court of Appeals, and gives Cameron's claims undeserved validity, that holding will withdraw existing knowledge from the public domain and will restrict free access to available public knowledge. That result is contrary to this Court's holding in *Graham*, and defeats the basis for federal patent law.

This Court noted in the *Cook* case (where a strong showing of commercial success was not persuasive in tipping the scale towards patentability) that simply being the first to combine or utilize the teachings of the prior art cannot support patentability, and the failure of others to avail themselves of such teachings is irrelevant. 383 U.S. at 36. As recently announced by this Court: "the mere existence of differences between the prior art and an invention does not establish the invention's nonobviousness." *Dann v. Johnston*, 425 U.S. 219, 230, 96 S.Ct. 1393, 1399 (1976).

Here, Cameron's witnesses testified that the modified Cameron valve operated exactly as expected based upon well known characteristics of the added fusible element. The valve was modified in the only way that was practical and logical without a total redesign of the valve. It was modified in an obvious way to obtain an obvious result. As such, the '600 patent is invalid.

CONCLUSION

For the reasons set forth in this petition, a writ of certiorari should issue in this case.

Respectfully submitted,

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ADDENDUM

On page 1, change "QUESTION PRESENTED" to "QUESTIONS PRESENTED" and insert the following:

Did the Court of Appeals fail to review the District Court's opinion to ascertain whether or not the District Court made the factual inquiries required by *Graham v. John Deere*, 383 U.S. 1, 86 S.Ct. 684 (1966), and fail to apply the rule of *Deere* to those inquiries?

Did the Court of Appeals fail to conform to its own standard of review for the enforcement of mandatory factual inquiries by trial courts?

On page 14, last paragraph after "below", please insert the following:

The Federal Circuit "per curiam" type decision on its face failed to review the District Court's findings of fact to ascertain whether or not the District Court complied with the inquiries necessary for a decision of patentability/unpatentability, and more particularly of obviousness required by *Graham v. John Deere*, 383 U.S. 1, 17-18, 86 S.Ct. 684, 693-94, 15 L.Ed. 2nd 545 (1966), and therefore should be reversed and remanded for a careful opinon. *Dennison Mfg. Co. v. Panduit Corp.*, 106 S.Ct. 1578, 1579 (1986).

We contend that such "per curiam" type decisions are, as a matter of law, inadequate to comply with the appellate court's duty of inquiry, and to indicate clearly whether or not the trial court applied the *Graham* test properly. Such cursory reviews represent a failure by the Court of Appeals for the Federal Circuit to carry out its statutory purpose; that is, to provide *guidance*, direction and uniformity in patent law. *See Federal Courts Improvement Act of 1982*, S.Rep. No. 275, 97th Cong., 1st Sess. 2 (1981).

Even Chief Judge Markey has acknowledged that the Court of Appeals for the Federal Circuit agreed, at the outset, that *every case would get an opinion* and *every opinion would tell the loser why he lost.* Markey stated:

> Keep in mind that the Court agreed at the outset to issue an opinion in every single case decided on the merits. Some would be published, some would not be, but every case would get an opinion and *every opinion would tell the loser why he lost.* That's the name of the unpublished opinion game; that's the bottom line; that's what it is all about. *That's what an unpublished opinion does. It tells the loser why he lost. It is a letter to the parties.*

The First Annual Judicial Conference of the United States Court of Appeals for the Federal Circuit, remarks by Chief Judge Markey, 100 F.R.D. 499, 510-11, May 20, 1983.

The Federal Circuit and Chief Justice Markey have failed to conform to their own standards of judicial conduct in this case. The opinion is improper because it does not tell the loser Axelson why it lost. As such, this defective opinion should be reversed.

Note: This opinion has not been prepared for publication in a printed volume because it does not add significantly to the body of law and is not of widespread legal interest. It is a public record. It is not citable as precedent. The decision will appear in tables published periodically.

United States Court of Appeals for the Federal Circuit

88-1615

CAMERON IRON WORKS, INC.,
Plaintiff-Appellee,

v.

AXELSON, INC.
Defendant-Appellant.

DECIDED: February 16, 1989

Before MARKEY, *Chief Judge*, NICHOLS, *Senior Circuit Judge*, and MAYER, *Circuit Judge*.

MARKEY, *Chief Judge*.

DECISION

Axelson, Inc. having failed to show error in the findings or conclusions reached by the district court, the judgment entered by that court must be and is *affirmed*.

UNITED STATES CODE

TITLE 35 — PATENTS

Section 103

Conditions for patentability; nor obvious subject matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. (Added November 8, 1984, Public Law 98-622, sec. 103, 98 Stat 3384.)

United States Patent [19] [11] **4,214,600**

Williams, Jr. et al. [45] **Jul. 29, 1980**

[54] **VALVE**

[75] Inventors: **Leonard E. Williams, Jr.; William M. Taylor,** both of Houston, Tex.

[73] Assignee: **Cameron Iron Works, Inc.,** Houston, Tex.

[21] Appl. No.: **12,383**

[22] Filed: **Feb. 15, 1979**

[51] **Int. Cl.**[2] **F16K 41/02;** F16K 17/38

[52] **U.S. Cl.** **137/72;** 251/330

[58] **Field of Search** 137/72, 74; 251/330, 251/214, 329

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,647,721	8/1953	Volpin	137/72
3,177,887	4/1965	Priese	137/74
3,630,483	12/1971	Canalizo	137/72X
3,788,600	1/1974	Allen	251/214
3,842,853	10/1974	Kelly et al.	137/72X

Primary Examiner — Arnold Rosenthal

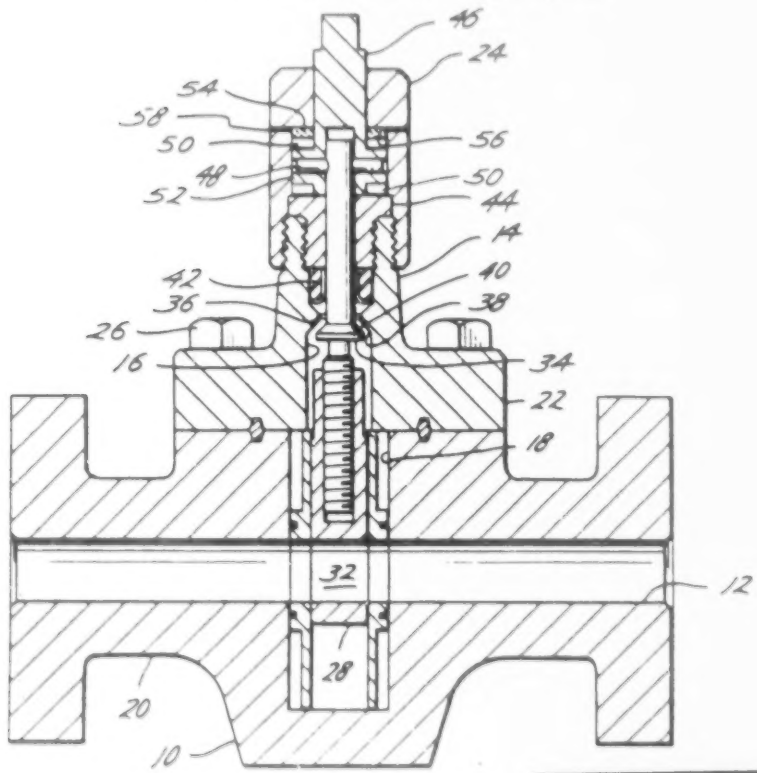
Attorney, Agent, or Firm — Vinson & Elkins

[57] **ABSTRACT**

A stem operated valve having a body and a bonnet secured to the body, a valve member movably positioned within the body, and a stem secured to the valve member and extending into the bonnet, a seat on the bonnet surrounding the stem, a

shoulder on the stem adapted to engage the seat, a stem packing positioned outward of the stem shoulder and bonnet seat, a fusible material at the outer end of the bonnet and stem supporting the stem with its shoulder spaced from the bonnet seat during normal operations and holes in the bonnet through which the fusible material exits when the valve is exposed to fire whereby the stem shoulder engages the bonnet seat to seal around the stem.

11 Claims, 2 Drawing Figures



PLAINTIFF'S EXHIBIT 1

000403

C.A. No. H-83-5138
(S.D. Tex.)

U.S. Patent 4,214,600

Jul. 29, 1980

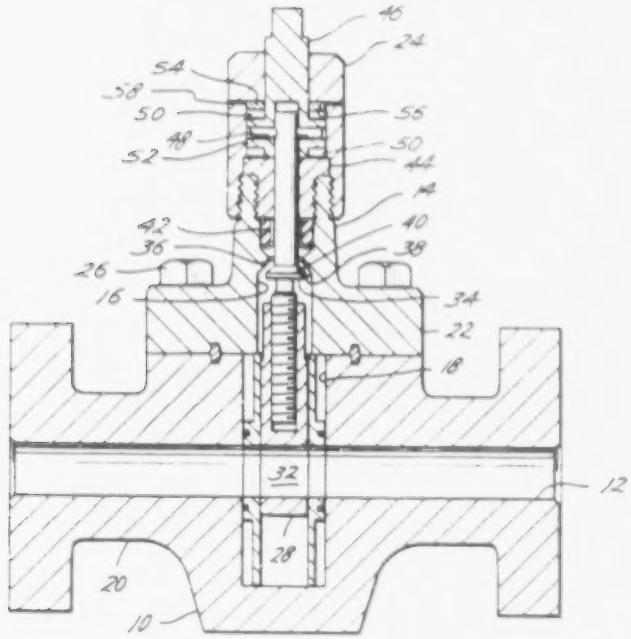


Fig. 1

000417

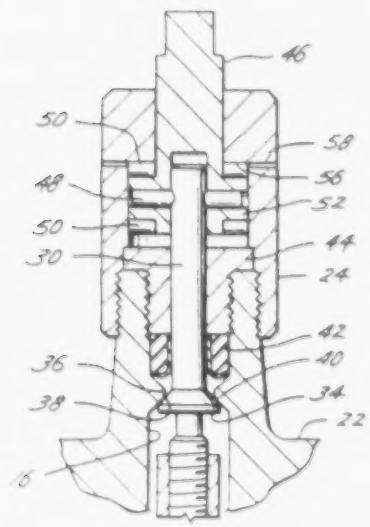


Fig. 2

VALVE

BACKGROUND OF THE INVENTION

Efforts have been made in the past to include fusible elements in stem operated valves so that leakage around the stem could be prevented by a metal-to-metal stem seal when the valve was subjected to fire. The H. Allen U.S. Pat. No. 3,788,600, the A. S. Volpin U.S. Pat. No. 2,647,721 and the W. M. Kelly et al U.S. Pat. No. 3,842,853 are examples of such prior structures.

The Allen Patent discloses a gate valve with a two-piece stem, the outer section of which telescopes with respect to the inner section. The outer section has a metal sealing shoulder which is held apart from a metal seat, located in the cap, by a fusible member. In the event of a fire, a metal-to-metal seal is formed between the stem shoulder and cap seat. This will effectively contain the line fluid; however, the cap must be made excessively large since it will be exposed to the high pressure of the line fluid.

The A. S. Volpin Patent discloses a valve with a fusible element supporting the bearing so that a shoulder on the stem engages a seat on the interior of the bonnet when the fusible element melts due to fire. This structure positions the stem packing on the outer end of the stem where it is more subject to heat than the fusible element and could fail before the fusible element to allow escape of fluids around the stem which are flowing through the valve and which fluids may feed the fire or complicate the fire fighting. Further, Volpin makes no provision for draining the melted material from the bonnet. Also, Volpin, as does Allen, requires the cap to be strong enough to contain the high pressure line fluid.

The W. M. Kelly et al Patent discloses a heat responsive safety valve in which the gate is held in open position by fusible material at the outer end of the stem retaining the stem from

axial movement. The occurrence of a fire melts the fusible material and responsive to a spring load the stem and gate move to close passage through the valve. There is no provision for a metal-to-metal sealing around the stem inward of the O-ring stem seal. Failure of such O-ring seal could lead to the leakage of fluids from the valve around the stem even though the gate had moved to closed position.

SUMMARY

The present invention relates to an improved fire safe, stem-operated valve.

The improved valve of the present invention includes a rotating stem for actuation of the valve member with a fusible element supporting the stem bearing at the outer portion of the stem so that the stem moves axially when the fusible element melts to bring a stem shoulder into sealing engagement with a seat in the bonnet and thereby prevent stem leakage even though the stem packing is destroyed by the heat.

An object of the present invention is to provide an improved valve which provides a metal-to-metal stem seal responsive to the excessive heat of a fire before the stem packing starts to leak because of such heat.

Another object is to provide an improved fire safe valve having a fusible element which can be easily checked for compressive stress failure and creep.

A further object is to provide an improved fire safe valve which assures that the fusible element melts before the stem packing fails responsive to excessive heat.

Still another object is to provide an improved fire safe valve with a fusible element therein and having provision for draining the melted fusible element from the interior of the valve.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the present invention are hereinafter set forth and explained with respect to the drawings wherein:

FIG. **1** is an elevation view of the improved valve of the present invention with portions shown in section to illustrate the components.

FIG. **2** is a detailed sectional view showing the stem seal responsive to a fire.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The improved valve of the present invention includes housing **10** which has flow passage **12** extending there-through and tubular extension **14** extending transversely to flow passage **12** and with bore **16** which terminates in chamber **18.** As shown in FIG. **1,** chamber **18** intersects flow passage **12.** Housing **10** includes body **20** and tubular extension **14** which includes bonnet **22** and cap **24.** Bonnett **22** is secured to body **20** by suitable securing means such as bolts **26** and cap **24** is threaded onto the outer end of bonnett **22.**

A closure member, such as gate **28,** is positioned in chamber **18** and adapted to be operated or moved by the rotation of stem **30** from a position in which port **32** through gate **28** is in registry with flow passage **12** to a position blocking flow through flow passage **12.**

Shoulder **34** provides a stop to properly position the gate **28** relative to flow passage **12.** Bonnet **22** includes upper tubular extension **14** having projection **36** in bore **16** to provide seat **38.** Stem **30** has a shoulder **40** capable of engaging and sealing against seat **38.** Packing **42** provides a seal between stem **30** and the interior of tubular extension **14.** Nut **44** is threaded into the upper end of extension **14** to retain packing **42.**

Adapter **46** is partly positioned in cap **24** and is secured to the outer end of stem **30** by pin **48** so that rotation of adapter **46** rotates stem **30.** Adapter **46** extends through the outer end of cap **24** and is provided with a suitable shape for rotation by a suitable device. Bearing means such a roller bearings **50** are provided to position adapter **46** within cap **24** by engaging annular flange **52** on adapter **46.** As hereinafter explained, bearings **50** are free to move in the bore of cap **24.**

Fusible material **54** is positioned against shoulder **56** in cap **24** to support bearings **50**. Such fusible material is preferably a eutectic metal having a melting point sufficiently above normal ambient temperatures to provide adequate support for bearings **50** under all normal conditions and yet melt promptly when the valve is exposed to fire. When material **54** melts it is drained or otherwise expelled from within cap **24** to the outside through drain holes **58** to assure that the material does not become trapped and continue to maintain support for bearings **50**. This assures that stem **30**, bearings **50** and adapter **46** are free to move axially to provide the metal-to-metal stem seal of shoulder **40** on seat **38**. The pressure within chamber **18** acts on the stem to urge it outward into such stem sealed position.

This outward position of stem **30** is illustrated in FIG. **2**. Material **54** has melted and existed through drain holes **58** and stem **30** has been forced outwardly by fluid pressure within chamber **18** to seat shoulder **40** on seat **38**. This prevents leakage of fluids flowing through flow passage **12** around stem **30** when packing **30** is destroyed or damaged by excessive heat.

Fusible material **54** is positioned in the outer part of the valve structure, i.e., immediately within cap **24**, so that it melts quickly when the valve is subjected to fire. With the material in this outer position, the mass of the body and the flow of fluids therethrough do not act as a heat sink to delay its melting. Further, it is relatively simple to check material **54** to be sure it has not been deformed as a result of compressive stress or

creep. Also, if material **54** is such that it creeps under the standard size of bearings **50** and cap **24**, the compressive stress may be reduced by merely changing the size of material **54** and cap **24** and providing a bearing washer to transmit the load from the bearings **50** to material **54**. Prior structures, such as shown in the Volpin Patent previously mentioned, would require extensive body modification to reduce the compressive stress on fusible material. Another advantage of this placement of material **54** is that it is protected by packing **42** from the fluids flowing through flow passage **12**. Fluids which include sour gas or hydrogen sulfide in any form normally attack the generally used fusible alloys.

The invention is, of course, applicable to valves having a stem operator, such as plug valves.

What is claimed is:

1. A valve, comprising

a body having a chamber open on the top and a passage extending through the body and in communication with the chamber,

a valve member movable in the chamber to open and close flow through said passage,

a bonnet having a central bore with a seat facing downward within said bore,

means securing the bonnet to the body around the chamber opening,

a stem extending through said bonnet bore and threadedly engaging said valve member,

an upwardly facing shoulder on the stem being normally in spaced relationship to said seat,

bearing means between the stem and the bonnet,

packing means sealing between the stem and the bonnet at a position between the seat and said bearing means,

a fusible element positioned in supporting relationship to said bearing means and normally retaining the stem shoulder spaced from the bonnet seat,

said fusible element being adapted, when heated, to relax its support of said bearing means so that the stem shoulder seats on the bonnet seat to prevent leakage around the stem whereby failure of said packing means as a result of heat does not result in fluid leakage around the stem.

2. A valve according to claim **1** including

means for draining melted fusible element away from its bearing supporting position.

3. A valve according to claim **1** including

a cap connected to said bonnet,

said cap having said fusible element positioned therein.

4. A valve according to claim **3** including

a stem adapter secured to the outer end of said stem and extending through a hole in said cap.

5. A valve according to claim **4** wherein

said stem adapter has an annular flange, and said bearing means includes a roller bearing positioned on each side of said annular flange around said stem adapter.

6. A gate valve, comprising

a body having a chamber opening to the exterior of the body and a passage extending through the body and communicating with the chamber,

a gate movable in said chamber to open and close flow through said passage,

a bonnet secured to the body around said chamber opening and having a bore with an inwardly projecting seat facing the body,

a stem threadedly engaging said gate, said stem extending through the bonnet bore and having a shoulder facing the bonnet seat and spaced therefrom in the direction toward the body a relative short distance,

packing means sealing between the stem and the bonnet bore and spaced from the bonnet seat in a direction away from the body,

bearing means surrounding the stem and positioned farther away from the body than said packing means,

a cap threaded to the bonnet, and

a fusible ring positioned within the cap is position for supporting the outer side of said bearing means when the cap is attached to the bonnet,

said fusible ring being of sufficient thickness to support said bearing means to maintain the stem shoulder spaced from the bonnet seat and when it melts by exposure to heat to allow said shoulder to engage and seal on said seat, and

the stem extending through the cap and having means secured thereto to rotate the stem whereby the gate is moved within the chamber.

7. A gate valve according to claim **6** including

a drain hole extending through the cap in a position to drain melted fusible ring from the interior of the cap.

8. A gate valve according to claim **7** wherein said fusible ring is a eutectic metal alloy having a melting point sufficiently above the normal temperatures to which it is to be exposed in normal valve operations without having excessive creep or

deformation from compressive stress at such temperatures and having a sufficiently low melting point to melt promptly when the valve is exposed to fire.

9. A gate valve according to claim **6**, including

a second shoulder on the stem to provide a stop for the gate to assure registry of the opening through the gate with the passage through the body.

10. A valve, comprising

a housing having a flow passage therethrough and a generally tubular shaped extension transverse to the passageway, the bore of which terminates in a chamber intersecuring the passageway;

a closure member in the chamber,

a stem in the bore for moving the closure member,

a shoulder on the stem,

a seat in the bore,

sealing means in the bore between the stem and said extension outwardly of the seat in the bore,

thrust bearing means in the bore outwardly of the sealing means,

said bearing means being attached to the stem and slidable in the bore,

an inwardly-facing shoulder in the housing outwardly of the bearing means, and

a fusible element in the bore sandwiched between said inwardly-facing shoulder and the bearing means,

said stem shoulder being normally spaced toward the closure member from said bore seat but sealingly engaging the bore seat upon melting of the fusible element.

responsive to pressure in the chamber to prevent fluid flow outwardly around said stem.

11. A fire-safe stem-type operator for a valve, the body of the valve having a flow passageway there-through, a chamber intersecting the passageway, and a closure member in the chamber, comprising

a generally tubular-shaped extension for the body to extend laterally of the passageway, having a bore for communication with the chamber,

a stem in the bore for moving the closure member,

a shoulder on the stem,

a seat in the bore,

sealing means in the bore between the stem and said extension outwardly of the seat in the bore,

thrust bearing means in the bore outwardly of the sealing means,

said bearing means being attached to the stem and slidable in the bore,

an inwardly-facing shoulder in the tubular extension outwardly of the bearing means, and

a fusible element in the bore sandwiched between said inwardly-facing shoulder and the bearing means,

said stem shoulder being normally spaced inwardly of said bore seat but moving to sealing engagement with the bore seat responsive to pressure in the chamber upon melting of the fusible element to prevent fluid flow outwardly around the stem.

* * * * *

Aug. 4, 1953 A. S. VOLPIN 2,647,721

ARRANGEMENT FOR REPACKING VALVE STEMS UNDER PRESSURE

Original Filed Oct. 6, 1947

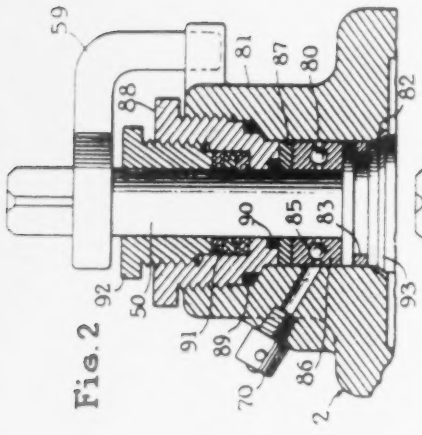


Fig. 2

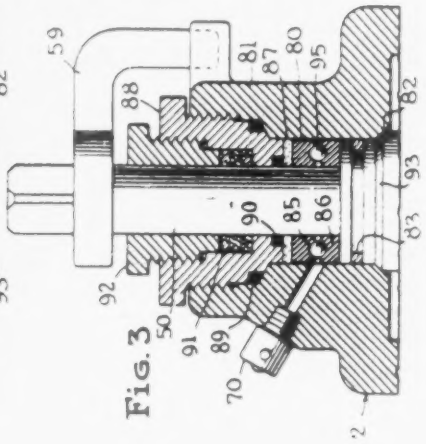


Fig. 3

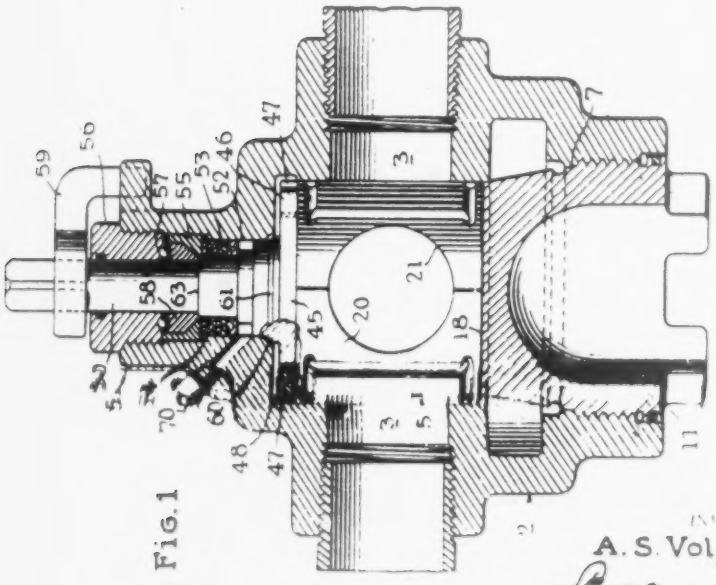


Fig. 1

INVENTOR
A. S. Volpin

BY

ATTORNEY

Patented Aug. 4, 1953 2,647,721

UNITED STATES PATENT OFFICE

2,647,721

ARRANGEMENT FOR REPACKING VALVE STEMS UNDER PRESSURE

Alexander S. Volpin, Houston, Tex.

Original application October 6, 1947, Serial No. 778,147. Divided and this application May 26, 1949, Serial No. 95,565

14 Claims. (Cl. 251—103)

This invention relates to valves and more particularly to valves with provision for replacement of the stem packing while the valve is under pressure. While the attached drawings show the invention embodied in a plug type valve provided with automatic lubrication features, it is equally applicable to a wide variety of other types of valves.

This application is a division of my prior co-pending application, Serial No. 778,147, filed October 6, 1947, for Automatic Lubricated Sleeve Plug Valve.

It is an object of the invention to provide a gland type packing for valve stems in combination with cooperating metal sealing faces on the stem and valve body where the faces may move into sealing position to permit replacement of the gland packing under pressure.

Another object of the invention is to provide a replaceable gland packing assembly for rotatable valve stems wherein a seal is provided upon axial movement of the valve stem during the replacing operation while the valve member holds the line pressure from passing through the valve.

A further object of the invention is to provide a dual packing assembly for rotatable valve stems wherein a metal to

metal seal is created due to the pressure on the valve when a fusible member permits axial movement of the valve stem.

A still further object of the invention is to provide a valve having a separable stem for movement of the valve member.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings, wherein —

Fig. 1 is a vertical sectional view of a plug valve embodying the invention and illustrating the plug in closed and sealed position.

Fig. 2 is a vertical section of the stem packing assembly including a fusible member to permit the formation of a seal about the stem in event the valve is subjected to extreme heat.

Fig. 3 is a section similar to Fig. 2, illustrating the arrangement after the valve has been subjected to heat.

In Fig. 1 the valve body **2** has a flow passage **3** extending therethrough to receive the ends of the pipe line in which the valve is to be incorporated. This flow passage **3** is intercepted by a vertical chamber **5** which is shown as being of uniform diameter where it intersects the flow passage **3**. Below the flow passage the body is tapered at **7** to provide an open base.

The upper or inner end **18** of the closure **11** serves to form the base of the chamber **5** against which the plug member **20** may abut.

The plug member **20** is shown in Fig. 1 as being made up of a hollow cylinder, and having the opening **21** therein to be aligned with the flow passage **3**.

In order to actuate or rotate the plug member **20**, a cross-head **45** is provided, as best seen in Fig. 1. This cross-head is arranged with recessed ends **46** which fit about the upstanding lugs **47** arranged substantially on a diameter of the plug. This

cross-head is, of course, axially movable with respect to the plug due to the provision of the space **48**, best seen in Fig. 1, at the top of the chamber **5**, so that there will be limited axial movement of the plug and the cross-head **45**.

The cross-head **45** has the valve stem **50** formed therewith and this stem extends through the upper reduced end **51** of the body. The opening **52** is arranged to receive the gland packing **53** as seen in Fig. 1 and this packing is retained in position by a junk ring **54**, the bushing **55**, and the gland **56**, which gland is screwed into the upper end of the body **51**. This gland also abuts against the anti-friction bearings **57** which are disposed against the bearing ring **58**. The bushing **55** retains the packing in position while the bearings **57** reduce the torque required to turn the valve. A stop and indicator arm **59** may be carried by the stem.

One of the particular features of this valve stem packing assembly resides in the arrangement of a beveled seat **60** in the body where the chamber **5** merges with the neck or packing opening **52**. The stem **50** is of the non-rising type but has a complementary beveled face **61** which is seen in Fig. 1 as being spaced from the seat **60** and retained in such spaced relation by the gland **50** and the bearings **57** due to the bearing ring **58** abutting against a shoulder **63**.

In event that the bearings **57** or the packing **53** require replacement, it seems obvious that by a slight unscrewing of the gland **56**, that the pressure within the valve will tend to lift the cross-head **45** and the stem **50** a limited distance. This axial movement of the stem causes the face **61** to move into engagement with the face **60** so as to form a metal to metal seal to prevent any leakage of the pressure from the pipe line or the valve chamber. When this seal is thus formed with the cooperating faces, the gland **56** may then be removed and the bearings or the packing, or both, replaced at will while the valve is under pressure.

In order to provide for sealing material for the gland packing **53** an additional fitting **70** is shown in the upper left hand portion of Fig. 1. This additional fitting permits introduction of sealing material into the packing area **52** and this sealing material will move upward due to line pressure and thus augments the sealing of the gland packing. When it is desired to remove the gland packing, pressure through the fitting **70** may be used to expel the packing.

Figs. 2 and 3 show a modified arrangement of the stem packing wherein the passage **80** in the neck **81** of the valve body has the sealing face **82** at its lower end where it merges with the valve chamber. The stem **50** is substantially the same as described in connection with Fig. 1 except that it may have an annular wiping ring **83** and the anti-friction bearings **85** may be arranged in the bearing race **86** about the stem **50.**

This bearing race **86** will be held in position by a fusible ring **87** of any suitable material, which is arranged to melt or become softened so that it may flow under pressure at a predetermined temperature. This fusible ring **87** abuts the gland **88** which is similar to the gland **56.** This gland in turn carries pressure type seal rings **89** and **90** to seal the gland with the body and the stem respectively. A conventional packing **91** is retained by the adjustable nut **92** threaded into the gland **88.**

The stem **50** has the cooperating face **93** thereon. The cooperating faces **82** and **93** are seen as the faces **60** and **61** of Fig. 1.

If for some reason it is desired to replace the bearings **86,** the fusible ring **87,** the packing rings **89** and **90,** or the packing **91,** it is only necessary to unscrew the gland **88** sufficiently to allow the valve stem to move upwardly until the faces **82** and **93** engage each other. A metal to metal seal is then formed and any desired replacement may be made.

Fig. 3 shows a fusible ring **87** as having been melted sufficiently to allow axial movement of the stem and the forming of the seal with the faces **82** and **93**.

The fusible metal is shown at **95** as having moved down in around the bearing in permitting the axial movement.

The invention contemplates a high pressure valve which enhances the safety of the valve because the stem packing and the stem thrust parts may be replaced while the valve is under pressure to avoid shut down of the line in which the valve is embodied. In event of fire, a safe stem seal is automatically formed by melting of the fusible ring, as seen in Figs. 2 and 3. This permits the automatic formation of a metal to metal seal.

Broadly, the invention contemplates a valve having a replaceable valve stem sealing assembly so that the stem may be repacked under pressure while the valve stem is sealed to the body; and a fusible member arranged in the valve stem packing assembly so as to permit the creation of a metal to metal seal when the valve is subjected to excessive heat.

What is claimed is:

1. A plug valve including, a body, a flow passage therethrough, a ported plug in said body to open and close said passage, means to feed sealing material to the downstream face of said plug, an operable stem separably engaging said plug, an anti-friction bearing positioned between said stem and said body so as to support the axial thrust on said stem, a packing about said stem, and cooperating sealing faces on said stem and body which are normally spaced apart by said bearing, and means to release said bearing to permit axial movement of said stem to create such seal while the plug is maintained in sealed engagement with said body, said means comprising a spacing member disposed between said packing and said bearing, said member being composed of material which is fusible at temperatures sufficient to impair said packing.

2. A valve including a body having a flow passage therethrough, a rotatable ported valve therein, a stem to rotate said valve, a slidable connection for said stem to said valve, a packing about said stem intermediate said stem and said body, means to resist the thrust on said stem including an anti-friction bearing disposed in said body surrounding said stem, cooperating metal faces on said stem and body retained in spaced relation by said means but released to move into engagement to seal said body about said stem due to the internal valve pressure upon release of said means so as to replace said packing, and a ring member surrounding said stem and interposed between said packing and said bearing, said ring member being composed of material which is fusible at temperatures sufficient to impair said packing.

3. A valve including a body having a flow passage therethrough and a valve member operable to open and close said passage, a valve stem extending into said body and engaging said valve member, cooperating sealing faces on said stem and body normally held in spaced relation, a packing for said stem, a member of low fusing point held in thrust by said stem whereby an elevation of temperature about said valve sufficient to impair the sealing of said packing will cause fusion of said member and allow pressure on said valve to move said stem outward to establish a seal between said faces thereby automatically shutting off line pressure against said packing.

4. A valve including a body having a flow passage therethrough, a valve member therein, a stem separably engaged to move said valve member and extending through a bore in said body, cooperating sealing faces on said stem and body, hold down means to normally hold said faces in spaced relation, an annular chamber between

said stem and bore to receive a packing and a stem thrust member, said hold down means adapted to close said bore and being releasably carried by said body to maintain said faces in spaced relation, said hold down means being releasable to allow the stem to move axially of said body and independently of said valve member to effect a seal about said faces so that the thrust member and packing may subsequently be entirely removed while said valve is subject to line pressure, and a spacer member interposed between said packing and said hold down means, said spacing member being composed of material fusible at temperatures sufficient to impair said packing.

5. A plug valve including, a body, a flow passage therethrough, a plug in said body to close said passage, means to feed sealing material to the downstream face of said plug, an operable stem separably engaging said plug, an anti-friction bearing to support the axial thrust on said stem, a packing about said stem, cooperating sealing faces on said stem and body, means to normally hold said faces spaced apart, said means being movable to release said bearing to permit axial movement of said stem to create such seal while the plug is maintained in sealed engagement with said body.

6. A valve including a body, a rotatable valve therein, a stem to rotate said valve, a slidable connection for said stem to said valve, a packing about said stem, means to resist the thrust on said stem including an anti-friction bearing, cooperating metal faces on said stem and body retained in spaced relation by said means but adapted to move into engagement to seal said body about said stem upon release of said means so as to replace said packing.

7. A valve including a body, a rotatable valve therein, a stem to rotate said valve, means to resist the thrust on said stem including an anti-friction bearing, cooperating

metal faces on said stem and body retained in spaced relation by said means but adapted to move into engagement to seal said body about said stem upon release of said means so as to seal said valve for replacement of said packing, said means also including a fusible ring to permit sliding of said stem and sealing of said faces in event of fusion thereof.

8. A plug valve, including a body, a valve plug therein, a stem to engage and turn said plug, interengaging slidable means on said stem and plug, a packing to seal between said stem and body, and means to form a seal between said stem and body to permit replacement of said packing while the valve is closed and under line pressure, including a pair of cooperating faces to move into sealing engagement upon longitudinal movement of said stem relative to said packing.

9. A valve having a body, a valve stem extending into said body, cooperating sealing faces on said stem and body normally held in spaced relation, a packing for said stem, a member of low fusing point held in thrust by said stem whereby an elevation of temperature about said valve sufficient to impair the sealing of said packing will cause fusion of said member and allow pressure on said valve to move said stem outward to establish a seal between said faces thereby automatically shutting off line pressure against said packing.

10. A valve including a body, a valve member therein, a stem separably engaged to move said valve member and extending through a bore in said body, cooperating sealing faces on said stem and body and normally held in spaced relation, an annular chamber about said stem, a packing therein to seal about said stem and body, a stem thrust member, releasable hold-down

means carried by said body and receiving the combined thrust of said packing and stem, the arrangement being such that a partial release of the hold-down means allows the said cooperating sealing faces to establish a seal upon an outward movement of said stem, said hold-down means being completely removable from said body to permit replacing of said packing while the valve is under pressure.

11. A valve including a body, a valve member therein, a stem separably engaged to move said valve member and extending through a bore in said body, cooperating sealing faces on said stem and body normally held in spaced relation, an annulus between said stem and bore to receive a packing and a stem thrust member, a releasable thrust hold-down member adapted to close said bore and carried by said body to maintain said faces in spaced relation, said hold-down being releasable to allow the stem to move axially of said body and independently of said valve to effect a seal about said faces so that the thrust member and packing may subsequently be entirely removed under pressure from said valve for replacement.

12. A plug valve including, a body, a flow passage therethrough, a plug in said body to close said passage, an operable stem separably engaging said plug, an anti-friction bearing to support the axial thrust on said stem, a packing about said stem, cooperating sealing faces on said stem and body which are normally spaced apart, and means to release said bearing to permit axial movement of said stem to create such seal while the plug is maintained in sealed engagement with said body.

13. A plug valve including, a body, a flow passage therethrough, a plug in said body to close said passage, an operable stem slidably engaging said plug, an anti-friction bearing to support the axial thrust on said stem, a packing about said stem, cooperating sealing faces on said stem

and body which are normally spaced apart, and means to release said bearing to permit axial movement of said stem to create such seal while the plug is maintained under pressure in sealed engagement with said body so that said packing may be replaced.

14. A lubricated plug valve including a body, a flow passage therethrough, a plug in said body to close said passage, means to feed sealing material to the downstream face of said plug, an operable stem slidably engaging said plug, an anti-friction bearing to support the axial thrust on said stem, a packing about said stem, cooperating sealing faces on said stem and body which are spaced apart, and means including said bearing to hold said faces in such spaced apart position, said means being releasable to release said bearing to permit axial movement of said stem to create such seal while the plug is maintained under pressure in sealed engagement with said body so that said packing may be replaced.

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